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ABSTRACT

In the fields of adult literacy and adult learning, most researchers have focused on the acquisition of various skills and abilities. Very little attention has been devoted to skill retention. Without more research information, it is difficult to know whether the literacy skills learned in the nation's adult education programs are likely to be retained for very long. A literature review was undertaken to summarize what is known about the following: (1) cognitive skill retention across the life span; (2) studies of literacy and basic skills retention; and (3) policy implications of skill retention work. The main conclusion of the study was that, although much is known about fields related to that of literacy retention, very little research has been done directly on the topic and serious work needs to be undertaken soon. A set of questions to guide future work in this area was developed. (Contains 68 references.) (Author/KC)

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NATIONAL CENTER ON ADULT LITERACY

USE IT OR LOSE IT? THE PROBLEM OF ADULT LITERACY SKILL RETENTION

Daniel A. Wagner
National Center on Adult Literacy
University of Pennsylvania

NCAL TECHNICAL REPORT TR94-07
JULY 1994

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The National Center on Adult Literacy (NCAL) was established in 1990 by the U.S. Department of Education, with co-funding from the Departments of Labor and Health and Human Services. The mission of NCAL addresses three primary challenges: (a) to enhance the knowledge base about adult literacy; (b) to improve the quality of research and development in the field; and (c) to ensure a strong, two-way relationship between research and practice. Through applied research and development and dissemination of the results to researchers, policymakers, and practitioners, NCAL seeks to improve the quality of adult literacy programs and services on a nationwide basis. NCAL serves as a major operating unit of the Literacy Research Center at the University of Pennsylvania.

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USE IT OR LOSE IT?

THE PROBLEM OF ADULT LITERACY SKILL RETENTION

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Abstract

In the fields of adult literacy and adult learning, most researchers have focused on the acquisition of various skills and abilities. Very little attention has been devoted to skill *retention*. Without more research information, however, it is difficult to know whether the literacy skills learned in America's adult education programs are likely to be retained for very long. This report is a literature review that covers what is known about (a) cognitive skill retention across the life span, (b) studies of literacy and basic skills retention, and (c) policy implications of skill retention work. The main conclusion of the report is that while much is known about fields related to that of literacy retention, very little research has been done directly on the topic and serious work needs to be undertaken soon. A set of questions to guide future work in this area is provided in the final section of the report.

INTRODUCTION: WHAT IS SKILL RETENTION?

The results of the 1993 National Adult Literacy Survey (NALS) indicate that a large percentage of American high school graduates perform poorly on reading and calculating tasks, so poorly that many refer to these individuals as functional illiterates with diplomas. It is commonly thought that such persons really never learned what was taught in school. However, another hypothesis exists, one that makes a great deal of sense to many people who once attended high school. These high school graduates simply failed to retain what they once learned. Some educators term this the "use it or lose it" phenomenon.

As in the case of foreign language study (discussed in more detail below), many of us know that we have forgotten much of what we may have known in other areas at one time or another. We have a sense that if we had practiced more, more regularly, with more intensity, and so forth, we would have retained this knowledge or skill. In the fields of adult literacy and adult learning, most researchers have focused on the acquisition of various skills and abilities, but very little attention has been devoted to skill retention. Indeed, in developmental psychology and in children's education, the very idea that cognitive and basic learning skills (as contrasted with specific items of factual knowledge) can be lost is anathema. The metaphor often invoked for literacy work is that of the bicycle: once you learn how to ride, it's impossible to forget. Specialists would say that non-forgetting is due to over-learning of some sort. But, how does this fit with the "use it or lose it" perspective? Not well at all.

One of the problems in the field of literacy is that our most literate citizens tend to be avid readers, and the least literate may hardly read at all. Many, if not most, of America's adults fall somewhere in between. Thus, it is not possible, without more information about individuals' reading practices and over-learning, to know whether literacy skills learned in America's adult education programs are likely to be retained for very long.

As a literature review, the present paper can only report what is known and not known about literacy retention and the retention studies that bear on the above issues. The paper is organized into several broad categories, from cognitive skill retention across the life span, to studies of literacy and basic skills retention, to the policy implications of this research.

COGNITIVE SKILL RETENTION ACROSS THE LIFE SPAN

HISTORICAL AND PSYCHOLOGICAL PERSPECTIVES

Prior to the discovery of writing systems, keeping track of accumulated bits of information contributed to an increasing burden on human memory. The oral tradition, which relied on the individual's memory, helped promote the use of mnemonics or specialized strategies that improved upon earlier methods of rote memorization. Yet one apparent cause for the rise of formalized educational settings, where students are explicitly taught a given body of knowledge, was that haphazard remembering was an inefficient manner of storing and conveying large amounts of information (Goody, 1977; Yates, 1966).

In the 19th century, there was a great flourishing of the study and use of memory for pedagogical purposes, particularly with the expansion of public educational systems in Europe and North America. Mnemonic systems for remembering facts and figures were in great demand and have remained so across many societies (Wagner, 1980). It was not, however, until the early 20th century that, especially in North America, scholars like John Dewey helped to promote what was certainly an educational revolution. This revolutionary pedagogy insisted on literacy with comprehension and critical thinking. In spite of a change in pedagogical rhetoric concerning the use of memorization in the classroom, school children and adults the world over still memorize considerable amounts of information, such as songs, poems, arithmetic tables, and so forth. There seems to be serious doubt about whether such uses of memory, with or without comprehension, can or should be eliminated altogether, which is probably why they still exist.

Attention to how children learn in school became, by the early 20th century, a major focus of scientific attention, especially among such eminent psychologists as Alfred Binet and Jean Piaget, among many others. Tests began to be developed that would be able to ascertain not only the rate of learning in school children, but also their aptitude for learning. These later became intelligence tests. For most of this century, the vast preponderance of studies of school-based learning have focused on the learning curve approach, that is, how quickly and accurately a learner could learn a given piece of new knowledge. It is to this type of research endeavor that we must first turn.

LEARNING, MEMORY, AND PRACTICE

The beginning of the scientific study of learning and memory in humans is largely credited to Ebbinghaus (1913), who in the late 19th century began to test how quickly he could memorize lists of words, moving eventually from words with meaning (i.e., real words) to words that would be "independent" of previous learning (i.e., nonsense words). This latter trend in isolating "items-to-be-recalled" became a dominant theme in the field of learning and memory until the last couple of decades (cf. Baddeley, 1990). During this era, the domain of learning and memory was dominated

by efforts to learn how human subjects (usually college sophomores in psychology classes) or laboratory animals remembered small bits of irrelevant information over varying lengths of time, under conditions that were varied systematically in order to understand the parameters of performance. This tradition, stemming paradigmatically from experimental psychology, with potential military applications (hence the human factors approach), was influential particularly in the decades following World War II.

An important turning point came with the work of Bartlett (1932), who argued for an emphasis on memory for real world phenomena. It took several decades for this work to be recognized as important, but over the last twenty years, there has been dramatic growth in research focused on everyday or real memory events, such as eyewitness testimony, memory for school facts, memory of autobiographical occurrences in real lives, and so forth (Gruneberg, Morris, & Sykes, 1978; Neisser, 1982). This research on memory was paralleled by a similar trend in broader domains of the psychology of learning, which focus on situational and everyday contexts (see below).

At present, there is considerable debate within the field of human learning and memory. While the 1970s seemed to produce a coherence of *information processing models* of memory, which included such terminology as long-term and short-term storage (Atkinson & Shiffrin, 1968), the field now presents considerably more differentiation. Studies have shown that the notion of "black boxes" in the head really does not hold up to the data which tend to indicate that the brain has many varied, overlapping, and redundant systems for retaining information. One of the main conclusions of these past decades of research on human learning and memory is that there is substantial support for the importance of meaning in the retention of information, derived from a model of memory based on the concept of *levels of processing* (Craik & Lockhart, 1972). While this idea may seem obvious, it took researchers nearly a century to move from the meaning-isolated approaches advanced by Ebbinghaus to the more meaning-centered approaches of Neisser and others. As the century closes, there is little doubt that the study of memory will continue to play an important role in understanding human cognition and in understanding what is retained following some type of formal or nonformal learning.

Finally, we turn to the issue of *practice*, a term that is widely used for all kinds of repetition of human behavior. In the realm of psychology and education, the concept of practice is returning again to serious discussion. From such disparate work as sociologist Pierre Bourdieu's (1977) *Outline of a Theory of Practice*, to anthropologist Jean Lave's (1988) *Cognition in Practice*, to psychologist Howard Gardner's (1983) *Frames of Mind*, there is a renewed effort not only to describe what people do in their everyday lives, but also the possible consequences of doing these things repeatedly. Practice is not a new topic. Ever since the first recorded studies of human psychology (the Greeks "method of loci" for remembering long folk stories may be the best-known example), observers have at least implicitly accepted the metaphor of "the mind as a muscle"—the more you exercise it, the stronger it becomes. From Ebbinghaus's pioneering work on human memory to more recent research on the Suzuki method for learning the violin, it is clear that

social scientists have long believed that mental practice is at the heart (or rather, the head) of skilled behavior.

In the domain of literacy skills, one would want to know how practice over varying conditions and intervals of time affects skilled performance. For example, can relatively low levels of practice over intermittent time periods succeed in maintaining low levels of original competencies in literacy? Before attempting to address this question in educational settings, it is useful to review what is known about the broader issue of retention.

LIMITS ON RETENTION: CAPACITY, FORGETTING, AGING, AND TRANSFER

Capacity

A classic issue in the study of memory is that of capacity. In the models of human memory described in the above section, it was typically assumed that short-term memory could store only a limited amount of information and for relatively brief periods of time (from milliseconds to minutes), while long-term memory was almost limitless in capacity and time duration of maintenance. Besides the numerous experimental studies supporting these capacity models, there existed a wide variety of compelling anecdotal evidence. In the latter category, it seemed obvious to many observers that memorizing unfamiliar names, telephone numbers, and other unrelated bits of information was an exceedingly difficult task, and that such information disappeared and remained virtually irretrievable once the mind began to concentrate on other cognitive tasks.

By contrast, many clinical observers, including Sigmund Freud, observed that human memory performance is often greater than our conscious minds suppose. There is now a massive body of evidence that humans retain a great deal of information that is not consciously or volitionally retrievable at any given time. Yet, under the right conditions, such as in psychoanalysis or in drug-induced states, many of these remembrances can be retrieved. Such data suggest that the brain continually stores incredibly large amounts of information that is unknown to the conscious mind, but that can be retrieved under the right circumstances.

What, then, is the capacity of human memory? In a comprehensive and insightful review, Landauer (1986) provides an integrated analysis of both learning rates and forgetting rates of individuals as a function of a lifetime of learning. Although many assumptions are required in such an analysis, Landauer claims that the average person acquires about one billion bits of information by mid-life, with learning and forgetting remaining roughly stable until older age. Just as interesting is his further claim, based on studies of the physiology of the brain, that the human brain's hardware (i.e., synapses) is capable of storing at least 1,000 times more information than the billion bit estimate of current memory usage. This conclusion supports claims that massive redundancy is physiologically possible within the brain, providing backup for forgetting, physical damage, and so on.

The implication of this brief review on memory capacity is that there is room for much greater growth in memory than humans normally believe

possible. While adults in adult basic education programs sometimes complain about not being able to learn more information (and they then relate this back to less-than-successful formal schooling experiences), it is safe to say that there are few limits on learning capacity, and there is no evidence to support the notion that poor retention is a function of reaching some type of asymptote in memory capacity.

Forgetting

The usual scientific term for what is lost or not retained in memory is *forgetting*. As noted above, there is a large research literature on this phenomenon that affects all human beings. The theoretical issues that surround forgetting are largely the same as those related to memory research, such as conscious versus unconscious knowledge, the role of meaning in the rate of forgetting, modality of original learning (such as via words or pictures), length of time since last repetition of information, and so forth (cf. Baddeley, 1990).

The issue of what can enhance the staying power of information, or concomitantly reduce that of forgetting, is central to understanding of retention. Yet, as with the early research on memory, the vast majority of studies of forgetting are based on experiments with bits of information, usually of little relevance to everyday life. Thus, there is a significant literature on the influence of *proactive* and *retroactive* interference on forgetting, that is, how prelearning and postlearning experiences interfere with the retrieval of accurate remembrances.

The literature on skill retention, as contrasted to the retention of units of related or unrelated information, is much smaller and will be described in the later section on educational perspectives. However, it is useful to consider for a moment why this is so. To some extent, skill retention can be seen as largely overlapping with information retention, especially in the areas of math, language, content learning, and so on. Yet there are areas that do not overlap, especially after the termination of sustained practice. One obvious area is that of physical skills, such as bicycle riding or piloting an airplane, where it is commonly thought that skilled performance needs very little in the way of refresher training in order to achieve high performance. Less clear are such areas as higher level cognitive skills (e.g., card or chess playing, or problem solving in math and science). In these areas, anecdotal information suggests that a fair amount of training is necessary before skilled performance can be re-achieved after termination of practice.

Aging

One might speculate that age-related decrements in brain function might have a negative effect on both learning and retention of literacy. There are two general approaches to this question, one is physiological and the other social psychological. On the physiological side, recent reviews by Salthouse (1991, 1993) and Singleton (1989) suggest that there are few known age-related barriers to reading acquisition, excluding the onset of observed dysfunction, such as Alzheimer's disease. This is so even though there is evidence suggesting that older adults show some increased difficulties in reading acquisition. But these latter findings on literacy acquisition appear to be social or psychological in origin, relating to the context in which older persons find

themselves in literacy programs (Weinstein-Shr, 1993). According to Salthouse (1993), there are almost no data in the research literature on the topic of aging and literacy/skill retention, although the topic has been commented upon anecdotally in certain subareas, such a foreign languages (see below).

Transfer

The issue of skill transfer is another large research domain with implications for the study of retention. Generally speaking, the educational research on transfer tends to focus on the importance of teaching and learning of specific versus general information or skills. For example, the study of classical languages (such as Latin or Greek) is often thought of as training the mind in a rigorous way, a way that then could be transferred to other types of learning and thinking. Similarly, there is a strong focus in mathematics learning research that supports the notion of learning general principles rather than specific pieces of information or facts. Everyone who has gone to school has a sense of the importance that many teachers place on the transfer of knowledge and skill.

The importance of transfer to skill retention concerns the role that additional practice (if different in kind from the original behavior) has on skilled performance. For example, what would the impact be of using literacy skills in church for the maintenance of literacy skills that are being learned in a workplace literacy program, or, to be more concrete, the role of practice in flying a one-prop plane on relearning how to fly two-prop planes? (Work on this issue has been undertaken; see Mengelkoch, Adams, & Gainer, 1971.) This second example makes it obvious that the questions of near and far transfer—words originally coined for studying rats and pigeons in laboratory experiments—still have relevance in today's psychology of learning and retention.

Indeed, the topic of transfer has been the subject of a number of major syntheses in recent years (e.g., Cormier & Hagman, 1987; Detterman & Sternberg, 1993; Saloman & Perkins, 1989). While there is still a great deal of ongoing research on transfer issues, there are those who now believe that transfer, at least for education and training purposes in the real world, has rather little value. In a major introductory chapter to *Transfer on Trial* (Detterman & Sternberg, 1993), Detterman claims that there is a dearth of solid data that can confirm the real transfer from the general to the specific, but "... if you want somebody to know something, you teach it to them" (Detterman, 1993, p. 15). There is still considerable debate in this domain, a debate that is mirrored in many of our models for school instruction. What is relevant to discussions of skill retention is the role that additional learning (if not identical repetitive practice) can play on the retention of skill.

One area in education where transfer studies have direct relevance is in second language learning. While more will be said below on the issue of retention and attrition, there are aspects of language learning and transfer that bear on the literacy domain. In a major review of this field, Odlin (1989) provides strong and comprehensive evidence for cross-linguistic transfer. He has found evidence that transfer occurs roughly equally among children and adults, in formal and informal settings, and in virtually all areas of language use, including morphology, phonetics, phonology, and semantics. Of

specific relevance to the present report is Odlin's conclusion that literacy skill in the native language can have an important impact on second language and literacy learning. This finding is similar to that found among Moroccan youth learning French language and literacy, having already learned to read in Arabic (Wagner, Spratt, & Ezzaki, 1989).

Transfer is an area that has received some attention in adult literacy work, and a recent report by Mikulecky, Albers, and Peers (1994) provides a comprehensive review. In this report, the authors make clear that transfer of literacy learned in adult literacy programs is likely to be quite limited. They distinguish between skill transfer at lower levels and what they term more "mindful" or higher level skills, suggesting that at either level, transfer is limited. In practical terms, different instructional approaches may be required for enhancing these two levels of skill transfer. Mikulecky and his colleagues conclude that learner attitudes or feelings of self-efficacy may be even more important than the transfer of specific skills. In applying these results to the study of skill retention, it is important not to lose sight of the need to carefully delineate what needs to be retained and how to know what has indeed been retained. As we move from psychometric tests of skills to possible changes in attitudes or perceptions, the study of literacy begins to take on a much broader set of issues. This is a topic that we will return to later in this paper.

School Learning and Retention Studies

It is in the domain of education that retention would seem to have its greatest social significance. Education is not only an attempt to get information into people's heads, but also supposed to be related to how much of the information gets retained before going out the proverbial "other ear." While all of us are generally aware of how much we cannot recall or retain from former schooling instruction, few of us have much sense about the effectiveness of the original instruction in helping the learned material to remain in a state of usable memory. Of course, as has been pointed out many times, there are numerous mnemonics (specialized memory strategies) that can help some information be retained for limited amounts of time, but we still know rather little about what is remembered over longer time intervals (such as weeks and months). In the following review of school-based research, the length of retention time appears to be a significant factor in retention. There are two areas that have a substantial corpus of published research, and each of these will be addressed in turn.

Studies of Summer Retention: A Season for Forgetting?

The growth of compensatory intervention programs with American children has led to an increase in the number of programs available in the summer months for children from disadvantaged homes. There are two related reasons for these summer programs. First, social planners have felt that students who are at risk of school failure could and should get additional instruction during the summer, and that this would help them catch up to more achieving students. Thus, summer schooling could help overcome inequalities in home support of children's achievement. Second, there is some research that suggests that there is a loss of school-based skills that occurs during the summer, and that this occurs more frequently in disadvantaged homes than in advantaged ones. Evidence in support of both of these arguments is provided in two excellent and comprehensive reviews

by Heyns (1987, 1988). In these syntheses, Heyns describes a series of major "summer effects" studies that show conclusively that American children tend to lose some basic skills (reading, writing, math) over the summer, skills that they spend the first month or two relearning at the beginning of the next school year. Furthermore, the data show that disadvantaged and minority youth lose more skills than do the more advantaged children. Finally, compensatory programs can stem the loss of skills among disadvantaged youth through summer intervention programs.

For the purpose of the present review, there are several points worth underscoring. First, even with sustained learning over almost nine months and at least several hours on task per day, studies show that a three-month interval without formal instruction does generally lead to a loss of basic skills. Second, the skills that suffer most of the loss tend to be ones that are taught through drill and those that require the learning of specific facts such as dates and vocabulary (Heyns, 1987). Third, the relearning and/or the maintenance of these school-learned skills is not difficult with additional learning. Finally, the overall efficiency of learning is reduced by the fact that previously learned material has to be relearned at a later date, causing weeks and months of time lost for new learning.

FOREIGN LANGUAGE LEARNING AND RETENTION

There now exists a small but growing field of research into what is termed *second language attrition*. Although stimulated by a book resulting from a conference entitled *The Loss of Language Skills* held in 1980 (Lambert & Freed, 1982), this subfield has its origins much earlier among teachers of classical languages. For example, in the early days of educational psychology, research was undertaken by Kennedy (1932) on Latin learning and attrition over summer vacation periods. Among the relevant findings was that Latin syntax skills were lost over the three summer months, and that those students with poorer initial skills and lower IQ scores tended to lose the most syntactic forms. Interestingly, it was found as well that the idiosyncratic errors that individual students made before the summer were precisely those aspects of behavior that were the best retained. This is not surprising if one assumes that such idiosyncratic mistakes must have been well learned in order to be resistant to the teaching of correct responses during formal instruction.

A half-century later, this type of study was repeated on a much larger database of nearly 800 adults who had earlier in life learned Spanish to varying degrees of expertise. In this well-known and technically excellent empirical study, Bahrick (1984) was able to shed light on some important problems in second language attrition, with implications for the present topic of literacy retention. With such a large sample of adults, most of whom reported little or no practice over long periods of time, Bahrick was able to show the impact of differing degrees of original skill on second language skill attrition. In this study, initial Spanish skill was measured by both grades and number of courses taken, while subsequent testing, undertaken as long as 50 years later, was measured through a battery of tests including grammar recall, idiom recall, vocabulary, and reading comprehension. Bahrick's most important finding was that considerable skill was retained over longer periods of time (from 5 to 25 years), in what he termed "permastore," where little was forgotten in spite of little practice. He found some decrement in

later life, in what might be taken as support for declines due to aging (see earlier section). More important for the present report are his findings on short-term retention over the first year and up to five years post-instruction. Here, Bahrick found considerable attrition in skill. For example, he found that a single course in Spanish was unlikely to leave much permanent store at all, and that the forgetting rates of individuals over the first five years following the end of language instruction was generally constant. This latter finding is interpreted as being due to the losses in recently learned information among individuals at all different levels. It should also be noted that the reading comprehension curves are virtually identical to the oral language curves in the Bahrick study.

While there have been different interpretations of the Bahrick findings (Neisser, 1984) and more recent research has been undertaken (Lanoue, 1991; Moorcroft & Gardner, 1987; Vechter, Lapkin, & Argue, 1990; Weltens, Van Els, & Schils, 1989), the Bahrick study has had a major impact on the field of second language acquisition. It is clear, for example, that while there may be an asymptote in forgetting over many years, there are important losses that most learners at different levels of expertise are subject to in the initial time period after the termination of instruction. Most important is the somewhat provocative finding that there is considerable loss in skill for beginning language learners, but relatively stable maintenance of skill of intermediate learners with little practice. Of course, it must be emphasized that this is second language learning among English-speaking Americans who learned Spanish as a second language in high school and/or college, a rather different population from the focus of literacy skill retention studies (i.e., the ABE learner).

The study of foreign language attrition is probably the most robust area in the skill retention literature. As pointed out by Freed (1982, p. 5), "We can (now) say with certainty that language attrition is a genuine phenomenon and genuine problem, but one about which we know relatively little." While this seems to be quite accurate with respect to the field of foreign language learning, the field of literacy has only just begun to address this set of issues with empirical research. Much of the relevant research derives from concerns about the quality and duration of adult literacy programs in developing countries, as will be described in the next section.

LITERACY SKILL RETENTION

INTERNATIONAL STUDIES

In the international education literature, the problem of retention of complex cognitive skills has been a focus of a considerable amount of discussion. For some years now, policymakers in Third World countries have been concerned that the limited years of primary schooling available for children might be insufficient for them to retain literacy skill. Indeed, it is sometimes claimed for developing countries that at least four to six years of primary school for children is the intellectual human resources floor upon which national economic growth is built. The argument is that a threshold

number of years of education is required for more-or-less permanent reading skills to be acquired by the school-aged child or adolescent (Fagerlind & Saha, 1983; Hamadache & Martin, 1987). This is one of the reasons that international organizations such as the United Nations agencies and the World Bank have called for greatly increased access to primary schooling in Third World countries.

Within this line of reasoning, the concept of literacy retention (sometimes termed *cognitive retention*; see Simmons, 1976) is central, since what children learn and retain from their school years (likewise for adults in nonformal and adult basic education programs) is thought to be what can be utilized in productive economic activities later on. When learners fail to retain what is taught in an educational program, educational *wastage* (a term often utilized by international agencies; Unesco, 1984) occurs. Those individuals (children or adults) will not reach the presumed threshold of minimum learning which would ensure that what has been acquired will not be lost and for self-sustained learning to be maintained.

Thus, the retention of literacy is a key goal of educational planners around the world, particularly in Third World societies where only modest amounts of education can be (and are) provided to a large and growing portion of the population. In such contexts, it is critical to know how much is likely to be retained from a given input of instructional time and financial resources. Since basic literacy skills have been the prime educational target for most Third World countries, it is apprehension about *literacy relapse* (falling back into a state of illiteracy) that has received the most attention from national and international policymakers. Furthermore, this concern has been particularly apparent in discussions around the quality of retention in literacy campaigns in developing countries (International Development Research Center, 1979; Hamadache & Martin, 1987; Lind & Johnston, 1986; Wagner, 1992).

Given the centrality of the assumption of literacy retention in policies governing basic education programs in developing countries, it is surprising to find how little attention has been devoted to its empirical study. Only a small amount of empirical research has dealt directly with literacy skill retention in developing countries (Gadgil, 1955; Hartley & Swanson, 1986; National Educational Testing Center, 1982; Roy & Kapoor, 1975; Simmons, 1976). Unfortunately, most of these studies had flaws in methodology or project design, and none used a multi-year longitudinal design with subjects as their own controls—a feature that is central to the credibility of the study of retention. In the Third World, an appropriate research design for literacy retention is complicated by the fact that primary school leavers may already be assumed to be among the lowest achievers in a school, making it difficult to compare their performance with those who remain in school; this is a limiting feature of most cross-sectional studies. A longitudinal design is required so that an individual's school achievement may be compared with his or her own performance in the years after leaving school.

To the best of our knowledge, there is only a single published longitudinal study of literacy skill retention (Wagner, Spratt, Klein, & Ezzaki, 1989). This study was carried out in Morocco and focused on the retention of literacy skills among adolescents, all of whom dropped out of school before completing the fifth grade of their studies and were followed

into everyday settings over a two-year, post-schooling period. The Moroccans in the study (N=72) were part of a larger study on the acquisition of literacy, so that the measures involved had considerable checking for validity and reliability, and substantial information was available on the social backgrounds of the youths, based on individual interviews in the home. The skill retention outcomes of this study were unequivocal; overall, Arabic literacy skills were not lost two years after the termination of schooling. Indeed, depending on the nature of post-schooling experience (e.g., work outside the home as contrasted with household chores mainly within the home), many adolescents actually increased their literacy skills. The only significant loss in skill was in basic math or computational knowledge, while general cognitive function (as measured by a logical reasoning task) showed no change whatsoever over time. One additional finding of some relevance was that French literacy skill, although studied much less than the national language of Arabic, was retained with only minimal loss after school drop out, a finding somewhat in contradiction to the foreign language attrition work cited earlier. These finding raise interesting questions about the skill level, or threshold, required before skills are permanently acquired, but no definitive explanation is available.

While this research lays to rest the myth that primary school dropouts who do not complete their studies will necessarily relapse into a state of illiteracy (as had been claimed), the study nonetheless leaves open many issues relevant to the present report. Most importantly, the Morocco project did not study short-term and intermittent study by adults, but rather the continuous study of a full, primary school curriculum among youth.

Adult Basic Skills in the United States

As noted above, the study of both the acquisition and retention of literacy skills among adult learners has been the subject of a great deal of speculation with a paucity of empirical findings. Two national studies are currently underway that will, over the next year or two, provide data primarily on literacy acquisition, but also touch on issues related to literacy retention among adults in the United States.

The first is the recently completed National Adult Literacy Survey (NALS). While not directly studying literacy acquisition, this survey has collected solid, empirical information on a broad and representative sample of nearly 26,000 American adults, with a wide variety of background characteristics. The results reported to date provide some important clues about the retention of literacy skills, beyond the well-publicized finding that nearly one half of the sample (and by extension, one half of the entire U.S adult population) functioned at the two lowest levels of literacy skill, low enough to be considered lacking in fundamental (prose, document, quantitative) skills for the American workplace (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993).

This highly charged finding made the news around the world, but it masked additional key results for the present review. For example, the NALS found that nearly 20 percent of adults who possessed a high school diploma were also in the lowest level, along with nearly 80 percent of those with eight or fewer years of schooling. This means either that these individuals, as school-aged students, did not learn the basic literacy skills that were taught,

or they failed to retain these skills once they left school. Furthermore, of the adults who had obtained the GED diploma (usually following some type of ABE program), nearly 15 percent were in the lowest literacy level, while more than half still scored in the lowest two levels. Their performance, in other words, was roughly indistinguishable from that of high school graduates, even though their training was necessarily later in life and closer to the time of the survey administration. Since the NALS was not a longitudinal study, it is impossible to know whether these perceived differences across time are due to retention issues or original lack of learning. Yet the study does suggest that whatever the inputs, in formal or nonformal education programs, the results are far less than policymakers had expected or desired.

Another national study of relevance is the ongoing National Evaluation of Adult Education Programs. The first two interim reports (Development Associates, 1992, 1993) provide the profiles of a nationally representative sample of ABE programs and the clients that they serve. These reports provide a compendium of useful background information, including the markedly limited amount of instruction received by many adults who enter these programs. For example, the second interim report found that nearly 36 percent of all new adult learners left their programs of study before completing 12 hours of instruction, essentially before any meaningful literacy learning could take place. In later reports from this study, assessment information on adult learners is expected, so that it should be possible to find out what levels of skills were actually acquired during those first 12 hours, by type of learner, program of study, and so forth. Although not directly focused on retention, this project, if a follow-up were done, will provide important information on the nature of the learning curves of various learners and programs across the United States.

Finally, a recent longitudinal study was conducted utilizing the large database of the New York City Literacy Assistance Center (Metis Associates, 1990). Among the findings is an analysis of the learning gains among adult ABE program participants at different levels of skill based upon entry-level measures. The most provocative finding was that the gains of most of the students came in the very first year of study, with almost no gains being made in the subsequent second or third year of study. Because this was a retrospective study, researchers did not have access to the students who participated in the study, but merely to the database existing after students left the program. These findings can, therefore, only be suggestive. One obvious hypothesis is that students attended programs for social rather than cognitive learning reasons for the later years of study; such a conjecture would fit with certain ethnographic studies of ABE programs (Fingeret, 1983). A related suggestion is that there might exist a threshold that different learners have such that little additional incentive drives additional learning after initial gains. Similarly, one might assume that retention of skill is rather strong in such programs; otherwise, learners might be able to make learning gains of a similar level during each year of the program (analogous to repeating a grade in school).

While the above empirical studies assessed skill levels and learning gains, very few studies have assessed American adult learners after leaving programs, and none of these studies is a systematic investigation of skill retention. Nonetheless, some studies collected self-reports by learners

regarding their ability to use skills after participation in programs. For example, Fingeret and Danin (1991), in an evaluation of a tutor-based, learner-centered program, found that program participation had an impact on learners' lives both in and out of the classroom. One of the most interesting findings was that learners' perceptions of the utility of their own literate behaviors was dependent on the context in which these behaviors applied. Thus, learners felt comfortable filling out a form in their small tutorial groups but experienced anxiety and a change to lowered perceived performance on the same task situated in an employment (more formal) context. This finding suggests that there may be important differences in the display or performance of literate behaviors that are context dependent (cf., Lave, 1988). If such findings are generalizable, it could mean that studies measuring both acquisition and retention curves need to be much more sensitive to learner perceptions than they have been heretofore.

Workplace and Occupational Skills

The acquisition and transfer aspects of work-related and occupational skills, including those in the military, has received a considerable amount of attention over the past decade, and interest has grown with the new policy emphasis on the changing workplace and the need for a skilled workforce (Berryman, 1993; Diehl & Mikulecky, 1980; Hirsch & Wagner, 1993; Mikulecky, 1982; Mikulecky & Lloyd, 1993; Philippi, 1988; Sticht, 1982, 1993). There also exists a small but active group of researchers, mainly in the field of human factors, that focuses on issues related to the retention, relapse, and retraining of workplace and occupational skills. Most of this work has been largely ignored within the literacy field.

Within the human factors domain, the primary focus of recent efforts seems to be on the importance of self-monitoring of skill acquisition (analogous to that of metacognition in adult literacy; see Paris & Parecki, 1993), so that retention can be enhanced. For example, Johnson (1981) provides evidence that individuals in an industrial training and retraining experiment showed quicker relearning when given guidance on how to better remember what might be forgotten. Similarly, other researchers studying management training (Marx, 1986; Noe, Sears, & Fullenkamp, 1990) have found that there is substantially more retention in training of functional knowledge when the trainees are informed of the possible loss of skills following the intervention and are given strategies for trying to limit forgetting (such as learning to handle feelings that might interfere with skill building and learning to diagnose the loss of trained skills).

Other studies on the learning and retention of workplace manual skills have less direct applicability to the cognitive retention issue, but provide some useful methodological techniques for analyzing learning gains and losses over time (Goldberg & O'Rourke, 1989). Factors in such studies include the intensity and amount of exposure to training, the time interval between assessments of retention, learner and context characteristics such as motivation and attitudes, and so forth.

POLICY IMPLICATIONS OF LITERACY SKILL RETENTION

While a topic of expressed concern for decades in developing countries, the American literacy community has paid little or no attention to the problem of literacy retention. As we have seen, the military and private sector have devoted substantive attention to training and transfer issues, but relatively little attention has been given to retention and retraining, and most of this has been on either the manual or management side of the question. A comprehensive search of available electronic databases has not turned up a single published study on the effectiveness of adult education programs in helping learners retain the skills they may have acquired during instruction.

Overall, adult literacy adult literacy policymakers lack information on the maintenance of skills learned in short-term and intermittent programs. While there has been some focus of concern about whether adults apply newly learned skills to activities beyond the classroom, one can rightly ask whether much can be applied if it is not retained. Of course, the questions of application and retention may be reciprocally linked, as application is clearly a form of practice which is likely to affect retention.

Despite these caveats, the public interest and support of literacy programs in the United States depends, as with the support for public education, on the claim that people who participate learn efficaciously and can retain enough to apply new skills to improve their life circumstances.

CONCLUSIONS

This review of the literature suggests that there is a major gap in the research on the issue of literacy skill retention. The empirical findings on cognitive skill retention are quite limited, but they do provide enough information to guide future investigations on key questions. These questions may be listed as follows:

- Are there parallels between the learning curves and retention curves among adults who attend adult literacy and adult basic education courses in the United States? Are different types of skills (such as reading, writing, calculating) affected differently? Are there components of broader skills (e.g., vocabulary, speed of reading) that are retained in different ways?
- More specifically, do levels of skill at program entry determine, in part, the retention of skill acquired in a given type of program?

- Are there certain kinds of programs (e.g., ESL, workplace, family) that enhance (or could enhance) the level of literacy skill retained?
- Do thresholds of expertise exist for certain skills that allow them to be better maintained over time? What is the role of over learning and automaticity on the retention of skills?
- What kinds of concurrent or post-instructional practice are conducive to skill retention? What might be the role played by metacognitive beliefs and attitudes toward learning?

As work continues in this area, we ought to be able to say much more than cavalier statements about literacy skill learning such as "use it or lose it." How much does use matter; what is the it in question; and, under what conditions might an individual lose recently learned skills? What we don't know about adult literacy skill retention far outweighs what is currently known. But until more light can be shed on this topic, we will never be certain of the return on investments in time, resources, and effort that we are making in adult literacy.[1]

ENDNOTES

[1] NCAL has recently started an empirical project in this area.

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